# Measures of Environment Health in Continua tan ic He ath and Human Services ep on nta **Iealth Tracking Program** Er **March 2005**

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# Purpose

The purpose of this document, Measures of Environmental Health in Montana, is to describe data collected in Montana relating to health and the environment. This report gives a brief overview of selected data measures with specific examples. It pays particular attention to each data measure's limitations.

This report is intended to:

- 1. Describe the significance of environmental health measures.
- 2. List currently available data on selected measures in Montana.
- 3. Assess Montana's progress toward Healthy People 2010 goals of the
- 4. Note limitations of these measures.
- 5. Provide resources for further information.

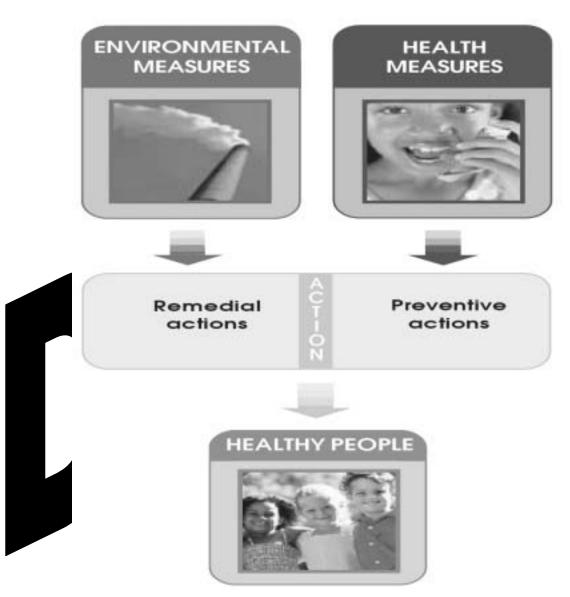
This report intended to be a guide to selected me res. It d ot include inform bn all measures. Each page is divided into six page inition, s cance Healthy P 2010 goal, data, limitations, and resources. On ges, ba data are nted. Comparison of Montana to National or other luded. Tł els have bes of comparisons, along with and reco ns for be found h the resource links at the age, wl

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# Introduction

The environment in which we live greatly affects our health. Since 1900 the average lifespan has increased 30 years. Much of this increase has been a result of improved environmental conditions. Improved sanitation, water quality, and waste disposal has allowed infectious diseases to decline as the leading causes of death. Now chronic diseases have become the major killers. While some ties between chronic disease and the environment have been well studied (such as air quality and breathing difficulties), many others are still under investigation.



#### Measures

The measures presented here describe some aspect of health or the environment. Health measures describe health effects that may have been influenced by the environment. Environmental measures describe a state of the environment which may affect human health.

# Relationship between health and the environment

Protecting health requires a better understanding of the relationship between the environment and health outcomes. Coordination between those collecting environmental data and those collecting environmental

#### **Measures in Montana**

This report contains information on selected pronments and the measures sign and to Montana. Twelve of these measures fall is a vironment with categories three measures describe health effects.

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Bures were suggested by members of the Montana Environmental Public Health Program Advisory Council, surveys of Montana citizens<sup>1</sup>, and through community aronmental needs assessments conducted in eleven Montana counties and tribal nations<sup>2</sup>. The results of the surveys and needs assessments can be found on the Montana DPHHS EPHT website, www.dphhs.mt.gov/epht. The measures listed here do not include all of the determined priority areas.

<sup>&</sup>lt;sup>1</sup> Montana Department of Health and Human Services. Surveys of County Commissioners, Public Health Nurses, County Sanitarians and Advisory Groups on Environmental Health Perceptions: 2005.

<sup>&</sup>lt;sup>2</sup> Montana Department of Health and Human Services. Community Environmental Needs Assessments Results: 2005.

#### **Definitions**

#### **Environmental Health**

Environmental health is concerned with the effects of the environment on health. The environment as referred to in this document includes the air, water and soil around us. Contaminants in the air, water, or soil, such as toxic chemicals and radon, are considered while biological agents such as viruses or food poisoning, the built environment including playgrounds and bike paths, and the social environment which can influence drug and alcohol use, have not been included.

#### **Environmental Health Measures**

A measure is a marker that can be assessed over time to see if a situation improvement worse. The ideal environmental health measure can be quantified, it is the environment to health, and is tied to public health objective.

# **Environmental Public Health Tracking**

Environmental Public Health Tracking (EPH) e ongoir alysis and interpretation of environmental and public Health Tracking is the integration of entail day and data to it see the understanding of the role of the ment in h

## Healthy People 201

Healthy People 201 blic he by the National set ob s de Heal f life for all Americans and with als o easing leng qu a dis avail Pe 010 goal has been included

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ers f ease ol and Prevention (CDC)

re Publ ealth Tracking

dc.gov/nceh/tracking/

at for State and Territorial Epidemiologists (CSTE)/CDC Environmental Indicators atp://www.cdc.gov/nceh/indicators/

Healthy People 2010

# http://www.health.gov/healthypeople/

<sup>&</sup>lt;sup>3</sup> United States Department of Health and Human Services. Healthy People 2010. Washington, DC:2000.



<sup>&</sup>lt;sup>1</sup> Council of State and Territorial Epidemiologists, Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, United States Environmental Protection Agency. Environmental Public Health Indicators: 2003.

<sup>&</sup>lt;sup>2</sup> Centers for Disease Control and Prevention. CDC's Environmental Public Health Tracking Program: Background. Accessed at http://www.cdc.gov/nceh/tracking/background.htm. March 2005.

## Montana

Montana covers nearly 146,000 square miles but has a little over 900,000 people. It is a rural state, with an average population density of 6 people per square mile. Forty-five of the 56 counties in Montana are frontier counties with less than 6 people per square mile. There are nine Tribal Nations in Montana living on seven Native American reservations. Native Americans make up 6% of Montana's population. The largest city in Montana is Billings in Yellowstone County with a population of 90,000<sup>1</sup>.

# Montana Counties and Tribal Lands



onited States Census Bureau http://www.census.gov/

Montana County Health Profiles http://www.dphhs.mt.gov/

# **Outdoor Air Quality**

## Criteria Air Pollutants

## **Definition**

Criteria air pollutants of concern in Montana include Particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), Carbon Monoxide (CO), Lead (Pb), and Sulfur Dioxide (SO<sub>2</sub>). Air quality attainment standards for each pollutant have been determined and are monitored by EPA.

# **Significance**

 $PM_{10}$  particulate matter encompasses any particle under 10 microns. This includes forest fires, power plant soot, car emissions, and wind-blown dust in the particles affect visibility, and can affect breathing, damage lung times by y.

Carbon monoxide (CO) is a poisonous gas produced by motor vehicles and wood-burning stoves. When CO enters the bloodstream, it reduces the amount of oxygen that is delivered to the ody's organs and muscles. His accordance to the control of control of the contro

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batter at signature signature to airborne lead.

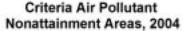


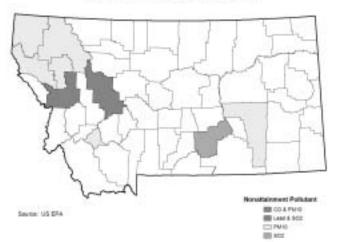
posure to air not meeting EPA standards.

Information on criteria air pollutants is collected by DEQ at 35 air monitoring sites throughout Montana. All or part of nine counties in Montana were in non-attainment for at least one contaminant in 2004. In 2004, 50% of Montana's population lived in air quality non-attainment areas.

#### Limitations

Ambient air monitoring levels may not accurately measure an individual's exposure. Air basins are large geographic areas that are likely to have a wide range of pollutant levels at any one time.





There are a limited number of air monitors for each area. Attainment levels are determined by taking an average of levels, and may mask short duration events of high-level exposure.

#### **Resources**

#### **EPA**

- 1. http://www.epa.gov/air/criteria.html
- 2. http://www.epa.gov/air/data/reports.html



#### **Toxic Air Emissions**

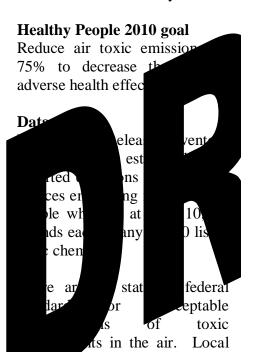
#### **Definition**

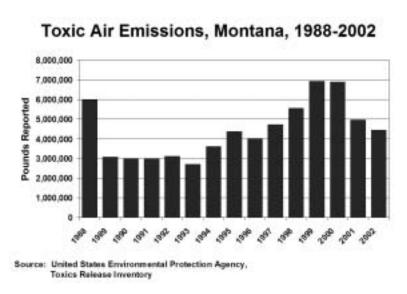
Toxic air emissions are harmful pollutants released into the air. There are many compounds known or suspected to cause serious health effects such as cancer or birth defects. The degree to which a toxic air pollutant affects someone's health depends on the amount of pollutant in the environment, the length of time the person is exposed, the amount of danger the chemical and the person's initial state of health.

## **Significance**

Millions of toxic pollutants are released into the air each year are a result of human activity. Emissions from factories, refineries are at two-thirds of manmade air toxics emissions, and motor vehicles

Toxics Release Inventory (TRI) requires certain pollufacturing and the control of the





atoring is conducted in only 12 of Montana's 56 counties and does not include toxic air anssions monitoring. Emissions estimates are currently the best available state-wide data for evaluating potential public health impacts from toxic air pollution.

TRI is a federal program conducted under the United States Environmental Protection agency (USEPA). TRI data are available from 1988. The type and number of facilities reporting to TRI and the type and number of toxins TRI requires these facilities to report have changed several times since 1988.

Figure 2. Toxic Air Emissions by County, 2001

The total pounds of toxic air emissions reported by in Montana in 2002 was 4,450,559 pounds, or over 2000 tons. This amount includes only those toxins that were reportable in 2002. The overall amount of toxic pollutants has decreased by 36% since the high of 6,926,923 pounds reported in 1999. Some toxins that were reportable in 2002 were not reported in 1999. In 2002 41 industries reported releasing toxins in the air.

Toxic air emissions were reported in sixteen Montana counties in 2001. Missoula County had the highest reported toxic air emissions with 1,657,388 pounds. This was nearly twice as much as reported by Rosebud county, with the second highest reported emissions at 871,460 pounds.



# **Indoor Air Quality**

## **Environmental Tobacco Smoke**

# **Significance**

At least 43 of the 4000 chemicals in tobacco smoke cause cancer. Each year an estimated 3000 nonsmokers die of lung cancer in the U.S. due to secondhand smoke. Asthma and other respiratory conditions are often triggered by tobacco smoke, as are heart attacks. Both home are workplace environments contribute to secondhand smoke exposure.

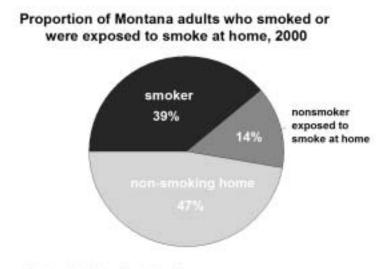
# Healthy People 2010 goal

Reduce the proportion of non-smokers exposed to environmental tobacco

### Data

Exposure to tobacco smoke can be determined in several ways that can be measured directly in blood. National 55% of no have measurable levels of cotinine in their blood. The levels are not a several ways that can be measured directly in blood. National 55% of no have measurable levels of cotinine in their blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured directly in blood. The levels are not a several ways that can be measured to be meas





Source: Behavioral Risk Factor Surveillance Survey

and presence of non-smoking family members. The BRFSS only asks the smoking status of one person in the household.

#### Resources

American Lung Association http://www.lungusa.org

Centers for Disease Control and Prevention, Tobacco Information and Prevention Source http://www.cdc.gov/tobacco/

## Radon

## **Significance**

Radon is a colorless, odorless, radioactive gas naturally found in the soil. Radon can accumulate in water and inside buildings where it is breathed in and damages lung tissue as it decays. After smoking, exposure to radon is the second leading cause of lung cancer. Any exposure to radon may carry a health risk.

#### **Definition**

The average outdoor radon level is 0.4 picocuries per liter of air (pCi/L), while indoor radon level has been estimated at 1.3 pCi/L. Buildings with radon level pCi/L can be remediated to reduce these levels.

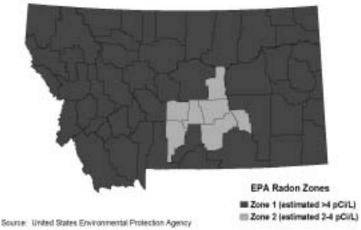
# Healthy People 2010 goal

Increase the proportion of persons who live in homes tested for radon concentrations.

#### Data

Because of its geological fe vast majority of Mo risk for elevated ra in areas with moder k, bu testi have at M don a an ır sured rado ncei ter th pC: hich

## Radon Zones in Montana



at w rado nediat recommended. EPA encourages all homes be tested for designation. ss of n, re

statewide data is collected on the numbers of homes tested or levels of radon found ana. Since residential histories are not collected from cancer patients, the proportion of ments who develop lung cancer as a result of radon exposure is unknown.

#### Resources

**EPA** 

http://www.epa.gov/radon/

# **Drinking Water Quality**

## Significance

Contaminated drinking water is a major cause of illness and mortality worldwide. In the United States, public water supplies are regulated, but many residents of Montana obtain their water from sources other than public water supplies.

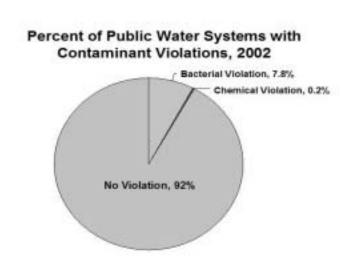
# **Healthy People 2010 goal**

Increase the population served by public water systems that meet Safe Drinking Water Act regulations to 95%.

#### Data

Public water systems (those which serve > 25 people) are required to monitor contaminants and verify these contaminants do not exceed EPA's maximum contaminant levels. M levels have been es 95 chemicals and contaminants by the

Drink



pul nated 899,000 people daily. les in ater g a Montar ded at restaurants, motels, and clud y on private water supplies or Γhe Monta ogrou s at ho unl

ater A

er systems were in compliance with EPA's 002, at 929 Iont ed fifty-seven systems were in violation for excessive imum min vels. vate acceeded the maximum level for synthetic organic chemicals, eria in dards for inorganic chemicals, and three systems had excessive nitrates eede syste were in violation for radionuclides in Montana. Systems may have Vo sy more than one area and may have more than one violation in each area.

## ations

he Safe Drinking Water Act only regulates 101 contaminants in water. Other contaminants are not monitored and do not have a regulated maximum level. Facilities are not required to test for every regulated contaminant each year. The required frequency of testing varies for each contaminant. People whose home is connected to a public water supply do not necessarily use that water supply as their primary drinking water.

It is estimated that 290,000 people in Montana, 32% of the population, obtain their water by private wells. Private well water is not routinely monitored for contaminants.

#### Resources

DEQ Public Water Supply Program http://www.deq.state.mt.us/wqinfo/pws/index.asp

EPA Office of Ground Water and Drinking Water http://www.epa.gov/ogwdw/dwinfo/mt.htm http://www.epa/gov/safewater



# **Hazardous Chemicals**

# **Superfund Sites**

#### **Definition**

Hazardous waste sites with the highest threat to human health are placed on the United States Environmental Protection Agency's National Priorities List (NPL). These sites are also known as superfund sites. The state of Montana maintains its own, more inclusive, list of contaminations in the state which are state priorities for cleanup.

#### **Formula**

Proposed NPL and state sites are evaluated using a hazard ranking systemative threat. The hazard scoring system considers the quantity, to pathways of chemicals at a site.

# Data State and National Superfund Sites in Montana There are currently 14 national superfund sites in Montana and 208 sites on. the state superfund Some of the nation are also on the state nu le p Superfund Sites azardd \* National Sources: United States Environmental Protection Agency Montana Department of Environmental Quality severi d by site d diffe ant exposure pathways. hical mina oxic Substances and Disease Registry (ATSDR) HazDat Database w.atsdr.cdc.gov/gsql/siteact.script EPA Superfund Program

http://www.epa.gov/superfund/sites/npl/mt.htm

Montana DEQ State Superfund Program http://www.deq.state.mt.us/StateSuperfund/Index.asp

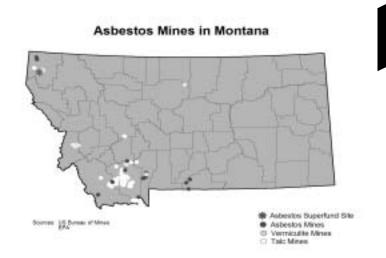
#### **Asbestos**

#### **Definition**

Asbestos is a naturally occurring mineral. It was used extensively in building materials and heat-resistant products. Asbestos has been shown to cause lung cancer and other health effects and was banned for most uses in the United States in 1973.

# **Significance**

Asbestos was mined throughout western Montana and has been found to be a contaminant in many and vermiculite talc mines. Asbestos-containing products were widely distributed across Montana and the United States. Although no longer mined or processed in Montana, asbestos contamination is still present. Asbestos has been shown to cause lung cancer and asbestos-related diseases mesothelioma and ask



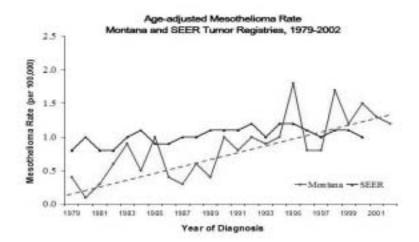
#### Data

s in Montana. Two hundred Out r asbe rela by, N regis easd 1979-2002 according to the e d he can na ıl T ince it is believed that over and Of isti nos, the rate of mesothelioma elio a res of i of asl nosis use exposi

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mesothelioma and the mobility of the population, it is difficult to determine where and when exposure to asbestos took place.



National data on mesothelioma was provided by the Surveillance, Epidemiology and End Results (SEER) National Tumor Registry.

#### **Resources**

Surveillance, Epidemiology and End Results (SEER) National Tumor Registry http://seer.cancer.gov/

ATSDR National Asbestos Exposure Review http://www.atsdr.cdc.gov/naer/index.html



Sources of Lead in Montana

Lead Sources
Lead Superfund Sites
Lead Emissions
Lead Mines

## Lead

# **Significance**

Exposure to lead affects the nervous system, especially in developing children. Lead exposure can cause learning disabilities, behavioral problems, and, at high levels, seizures, coma, or death.

# Healthy People 2010 goal

Eliminate elevated blood lead levels in children.

#### Data

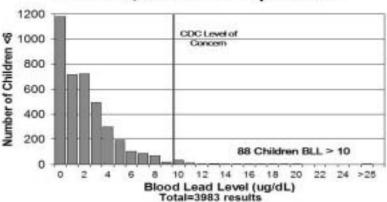
Lead can be found in the paint in older homes (pre-1978), is a criteria air pollutant tracked by EPA, as smelted in Montana.

Lead poisoning is a reportable condition, and ug/dL (th lead le C cutoff for action) must be rep **DPHHS** nandate to ately, e that lead testing is condu ustries and child no wor ocessi lowincome households 5 ay in p ing sl be tested for lead ning. In Montana, less th hildren have been screer or lead ∕o of ars o er pois DC 1 mends



children at risk for lead solvening, and even fewer adults are screened for high blood lead levels.

# Results of Blood Lead Testing Montana, Jan 2000 - April 2004



There is evidence that levels of blood lead below the CDC level of concern can have neurological and behavioral effects.

#### Resources

CDC's Childhood Lead Poisoning Prevention Program http://www.cdc.gov/nceh/lead/lead.htm

# **Mercury and PCBs**

# **Significance**

Mercury is a naturally occurring heavy metal that may cause neurological damage and birth defects. Polychlorinated biphenyls (PCBs) are a mixture of chemicals which may cause neurological damage in children and have caused cancer in animal studies. In the environment, mercury is converted to methylmercury. Methylmercury and PCBs in streams and lakes are taken up by animals and fish. Neither of these chemicals break down over time but instead bioaccumulate.

# **Healthy People 2010 goal**

Reduce human exposure to heavy metals and other persistent chemical by contaminant levels.

#### Data

er 1200 miles of In Montana, high mercury levels accounted for the pairment s and 2 miles of strean 419,000 acres of lakes and wetlands in 2004. same y over 129,000 acres of lakes were impaired by PCB d had data ind out of 29 fish with mercury levels above 0.16 μg/g, at whi nd wome childbearing age should not eat **PCB** kes had fis one or per mo levels above 0.025, the ne meal per week no one more t

# Limitations

Not The amount of fish eaten ntana erway re test br m or known. Testing for heavy wate ırtic by wo en, Iontana fish is not currently narkers ≀ho sten

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Wildlife Service

wp.state.mt.us/fishing/default.aspx

## **Pesticides**

#### **Definition**

Pesticides are chemicals used to kill animal or plant pests.

# **Significance**

People may be exposed to pesticides through the air, water, soil, or food supply. In additional commercial agricultural use, many pesticides are used in homes, schools, parkellocations. The long-term effects of many types of pesticides, especially the coexposure to multiple chemicals, have not been sufficiently studied.

# Healthy People 2010 goal

Reduce by 50% the pesticide exposures that result in visits to a are facility.

# **Data and Limitations**

Nearly 20% of Montana's 94 million acres is can be as crop

The Montana Department iculture information people who by for commercial pesticides armits. It is mation to the currently not according to the currently information is mation.

The nt of Heal d Hun ervi es no e information on the number osur tree visits to cili Montana.

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ass.usda.gov/mt/

# **Health Measures**

#### Cancer

#### **Definition**

The extent of cancer occurrence is most commonly determined by two measures:

Cancer Incidence: The rate of newly diagnosed cancer cases in a given area and time period (usually one year).

Cancer Mortality: The rate of deaths due to cancer in a given area and time period.

#### **Formula**

 $\frac{\text{newly diagnosed cancer cases in one y}}{\text{number of people in the population}}$ 

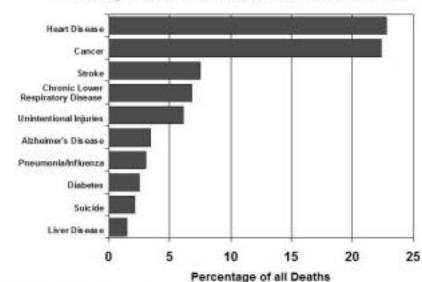
 $\frac{\text{number of deaths due t}}{\text{Mortality}} = 100,000 \text{ x} \qquad \frac{\text{number of deaths due t}}{\text{number of people}} \qquad \frac{\text{r in one t}}{\text{pulation}}$ 

To compare populations. The age distributes are added to take into the age distributes of each population.

# Significance

seco ading h iı nta spec of binati ronme fac ma a role bkiı high iets a wn man bes ncer. strial micals have also been carcinogenic. ational exposures are mought to account for 5% of cancer deaths. Unfortunately, cancer is common enough for multiple cases to occur in the neighborhood under normal circumstances.

# Leading Causes of Death in Montana, 2002



Office of Vital Statistics, Montana Department of Public Health and Human Services

# Healthy People 2010 goal

Reduce the overall cancer death rate to 159.9 deaths per 100,000 people.

#### Data

Each year, approximately 2000 Montanans die from cancer, accounting for over 20% of the overall deaths. An additional 5000 people in Montana are newly diagnosed with some form of invasive cancer each year.

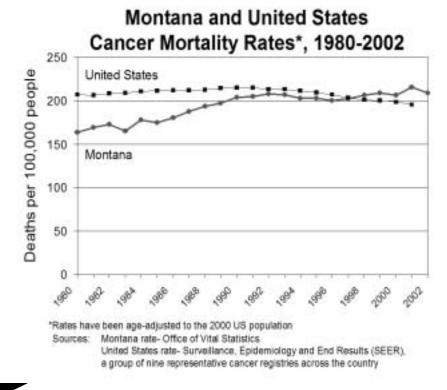
The Montana cancer mortality rate in 2002 was 209.0 deaths per 100,000 people. Monta cancer death rate has been steadily rising for the past twenty years while the nation death rate has started to

decline.

#### Limitations

The time between a cancer diagnosis and its report to the tumor registry can be up to a year. Cancer patients seen only clinics or private physician offices and not at hosp may not be reported registry. The long perio ost ılt to  $^{1}$ C sure. matio isk expo ently labl er pat ncer Society cancer.org nonal Cancer Institute

http://www.cancer.gov



Surveillance, Epidemiology and End Results (SEER) http://seer.cancer.gov

#### **Asthma**

#### **Definition**

Asthma is a complex illness influenced by both environmental and genetic factors. Symptoms include wheezing, shortness of breath, tightness in the chest, and cough.

# **Significance**

Asthma is among the most common chronic diseases in the United States, especially among children. Effective asthma management includes controlling exposure asthma triggers appropriate use of medicine. Many indoor and outdoor air pollutants, including tobar particulate matter and exposure to SO<sub>2</sub> can trigger asthma attacks.

# Healthy People 2010 goal

Reduce deaths, hospitalizations, emergency department visits, and school or work days missed due to asthma.

#### Data

A estimated 60,000 (8.9%) Montana's adults report had asthma in 2003.

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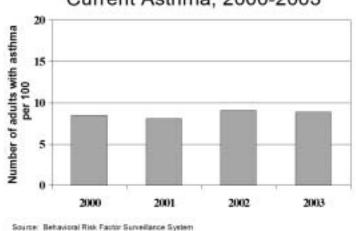
e eme y ro caus a caus a firman. The most ER visits reported for one person was or mo in two removes a one-year period. In 2003, the average number of days ed from the firman and the second of the lts because of asthma was 10 days.

three Montana community health centers, childhood asthma prevalence was found

#### amitations

Information on death records provide only the primary cause of death, not contributing causes of death. Information on hospitalizations, emergency department visits, and clinic visits are not available in Montana. The BRFSS is a self-report survey telephone survey of non-institutionalized adults. Information provided is not independently verified. Additional information on pediatric asthma is not currently available.

# Prevalence of Adults with Current Asthma, 2000-2003



#### Resources

American Lung Association http://www.lungusa.org/

Centers for Disease Control and Prevention, National Center for Environmental Health http://www.cdc.gov/asthma/default.htm



## **Birth Defects**

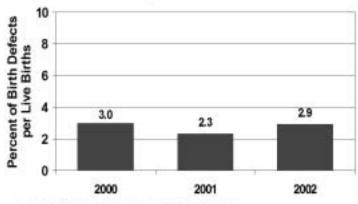
#### **Definition**

A birth defect is an abnormality of structure, function, or metabolism present at birth that results in physical or mental disability of the child.

# **Significance**

Birth defects are the leading cause of death in the first year of life. Factors contributing to most birth defects are unknown. For the small proportion of birth defects whose causes are known, both genetic and environmental factors play a role. Some factors which can lead to birth defects include drug or alcohol abuse and exposure to chemicals such as mercury or lead.

# Percent of Birth Defects Reported per Live Births, Montana 2000-2002



Source: Montana Birth Outcomes Monitoring System

#### Data

In Montana, app babies have abno cond ese children have reportable eir bi rtifica repo ach ye  $\Gamma$ hre dred ts is unknown. he n of riages irth

#### ualit

ates ar cted by the Montana Office of Vital ormal tior rth g as an injury sustained during birth, are not birth stics. abili ha Birth Outcomes System collects information on cts bu cau on comes primarily from hospitals and covers children eporta th o Τŀ Information on children not seen in hospitals may not be birth gh vears ured.

imes

ww.modimes.org/

Montana Kids Count http://www.bber.umt.edu/